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11. SUPPLEMENTARY NOTES

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12a. DISTRIBUTION / AVAILABILITY STATEMENT

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12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 Words)***

Support was extended to a graduate student, pursuing a Ph.D. degree, and an undergraduate student. Together they worked on measuring the momentum transfer of energetic Ne^+ ions impinging on a Si(100) surface. Scattering experiments and classical trajectory calculations were utilized to determine the energy and angular distribution of the scattered projectiles. This work is relevant to predicting and reducing spacecraft drag in a low-earth orbit environment.

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FINAL TECHNICAL REPORT

"Investigation of Hyperthermal Energy Ion/Surface Reactions"
AASERT Grant F49620-95-1-0370
1 Jun 95 - 31 Oct 98
Parent Grants: F49620-95-1-0128 and F49620-98-1-0029

Dr. Dennis Jacobs, Associate Professor
Department of Chemistry and Biochemistry
University of Notre Dame
Notre Dame, IN 36556

This AASERT grant has supported Ms. Patty Smith in her doctoral studies. Patty has investigated the transfer of energy and momentum associated with hypervelocity Ne^+ colliding with a Si(100) surface. She has gained experience in preparing and cleaning single-crystal samples for UHV, recording X-ray Photoelectron Spectra (XPS), generating well-characterized beams of atomic ions, and detecting scattered ions with Quadrupole Mass Spectrometry (QMS). By measuring the energy of scattered projectiles as a function of scattering angle, she has determined that single-scattering events predominate even at relatively low collision energies. However, as the collision energy decreases, the Ne^+ projectile interacts with an increasing number of Si atoms during its brief repulsive interaction with the surface. This information is useful for predicting the drag of a spacecraft in low-earth orbit. It may also be profitable for designing spacecraft materials that minimize aerodynamic drag. Patty has also begun studying abstraction reactions involving NO^+ incident on O/Al(111) to form NO_2^- and NO_2^+. In this case, the NO^+ ions were generated state selectively. Thus, the reaction probabilities can be explored as a function of collision energy, vibrational energy, and molecular alignment.

In the summers of 1997 and 1998, Mr. Jon Camden, a Notre Dame undergraduate chemistry major, was supported by AASERT. Jon has written a computer program to simulate the aforementioned Ne^+/Si(100) scattering results. Using classical mechanics, he has developed trajectory code to simulate individual scattering events. It is hoped that the simulations will allow us to predict scattering behavior over a wider range of systems than has been experimentally studied.

Both of these students have made great progress in their academic programs. Patty is predicted to finish her Ph.D. within two years. Jon is planning on attending graduate school after he earns his B. S. degree next year.

AUGMENTATION AWARDS FOR SCIENCE & ENGINEERING RESEARCH TRAINING (AASERT) REPORTING FORM

The Department of Defense (DoD) requires certain information to evaluate the effectiveness of the AASERT Program. By accepting this Grant which bestows the AASERT funds, the Grantee agrees to provide 1) a brief (not to exceed one page) narrative technical report of the research training activities of the AASERT-funded student(s) and 2) the information requested below. This information should be provided to the Government's technical point of contact by each annual anniversary of the AASERT award date.

1. Grantee identification data: (R&T and Grant numbers found on Page 1 of Grant)

a. University of Notre Dame
University Name

b. F49620-95-1-0370
Grant Number

c. FO8671-9501296
R&T Number

d. Dennis C. Jacobs
P.I. Name

e. From: 1 Jun 1995 To: 31 Oct 1998
AASERT Reporting Period

NOTE: Grant to which AASERT award is attached is referred to hereafter as "Parent Agreement".

2. Total funding of the Parent Agreement and the number of full-time equivalent graduate students (FTEGS) supported by the Parent Agreement during the 12-month period prior to the AASERT award date.

a. Funding: $ 140,470

b. Number FTEGS: 1

3. Total funding of the Parent Agreement and the number of FTEGS supported by the Parent Agreement during the current 12-month reporting period.

a. Funding: $ 101,666

b. Number FTEGS: 1

4. Total AASERT funding and the number of FTEGS and undergraduate students (UGS) supported by AASERT funds during the current 12-month reporting period.

a. Funding: $ 38,010

b. Number FTEGS: 1

c. Number UGS: 1

VERIFICATION STATEMENT: I hereby verify that all students supported by the AASERT award are U.S. citizens.

Dennis C. Jacobs
Principal Investigator

2-18-99
Date